EAST Search History

Ref #	Hits	Search Query	DBs	Default Operator	Plurals	Time Stamp
L1	18	(zero adj shrink) with ceramic	US-PGPUB; USPAT	OR	ON	2007/03/02 13:22
L2	4574	thermocompression with (bond or bonding)	US-PGPUB; USPAT	OR	ON	2007/03/02 13:23
L3	190	2 and MEMS	US-PGPUB; USPAT	OR	ON	2007/03/02 13:24
L4	86	3 and @ad<"20030630"	US-PGPUB; USPAT	OR	ON	2007/03/02 14:32
L5	195	438/25,51,106-108,113.ccls. and MEMS and @ad<"20030630"	US-PGPUB; USPAT	OR	ON	2007/03/02 13:41
L6	3008	257/414,678,684,704.ccls. and @ad<"20030630"	US-PGPUB; USPAT	OR	ON	2007/03/02 13:45
L7	203	6 and MEMS	US-PGPUB; USPAT	OR	ON	2007/03/02 13:45
L8	17	(("20050024165") or ("20050006738") or ("20040262645") or ("20040012464") or ("20030047799") or ("20020000649") or ("6914323") or ("6903452") or ("6900773") or ("6891239") or ("6876056") or ("6853067") or ("6852926") or ("6713314") or ("6673697") or ("6559530") or ("6511894")).PN.	US-PGPUB; USPAT	OR	OFF	2007/03/02 14:34
L9	1	("6630725").PN.	US-PGPUB; USPAT	OR	OFF	2007/03/02 15:10
L10	2	(("6498422") or ("6228675")).PN.	US-PGPUB; USPAT	OR	OFF	2007/03/02 15:11
L11	3	(("6373130") or ("6214644") or ("5880403")).PN.	US-PGPUB; USPAT	OR	OFF	2007/03/02 15:11

US-PAT-NO: 6846725

DOCUMENT-IDENTIFIER: US 6846725 B2

TITLE: Wafer-level package for micro-electro-mechanical systems

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Detailed Description Text - DETX (7):

In a next Seed Layer Deposition step 304, a seed layer 358 is deposited on a sacrificial wafer 360. The seed layer 358 can be a metal such as gold (Au) or copper (Cu), which also acts as a **bonding** layer for **thermocompression** or the like compression process. Before the seed layer 358 is deposited on the sacrificial wafer 360, a metal barrier 359 comprising of Titanium or Tantalum can be deposited on the sacrificial wafer 360 for providing adhesion between the seed layer 358 and the sacrificial wafer 360. Then in a Wafers **Bonding** step 306 **thermocompression** or the like compression process is applied to the cap wafer 352 and the sacrificial wafer 360 with the seed layer 358 sandwiched therebetween. Conventional **thermocompression** settings optimised for the proper **bonding** of the two wafers are preferably used in this case.

Detailed Description Text - DETX (11):

In a Package Integration step 312, the cap wafer 352 is solder bonded to a MEMS wafer 372 having a MEMS device 374 with a movable structure 376 using solder patterns 378, which are formed by conventional processes such as screen printing or lithography and etch, to form a wafer stack. Signals and electrical supply to the MEMS device 374 are conveyed to the MEMS device 374 via MEMS pads 379 formed on the MEMS wafer 372, which are congruent with and connected to the interconnect pads 366 on the cap wafer 352 using the solder patterns 378 on the cap wafer 352. Similarly, bond pads 380 formed on the MEMS wafer 372 are also congruent with and connected to the bond pads 368 formed on the cap wafer 352. Most importantly, the MEMS cavity 370 is congruent with the MEMS device 374 when superposed over the MEMS device 374 so that the movement of the movable structure 376 is unimpeded within the MEMS cavity 370. Alternatively, the cap wafer 352 may be bonded to the MEMS wafer 372 using a **bonding** material such as metal or solder suitable for **thermocompression** or the like compression processes instead of the solder patterns 378. To complete the wafer-level MEMS package, solder bumps are applied to the interconnect pads 364 by conventional processes such as screen printing or lithography and etch, and the wafer stack singulated. Alternatively, the solder bumps may be formed

directly in place of the interconnect pads 364 formed during the Cap Wafer Processing step 310 by switching the electroplating solution and/or process after the electroplating process in the Via Electroplating step 308 to appropriately apply the solder bumps.

Detailed Description Text - DETX (18):

In a Package Integration step 410, the cap wafer 452 is solder bonded to the MEMS wafer 472 having a MEMS device 474 with a movable structure 476 using solder patterns 478 to form a wafer stack. Signals and electrical supply to the MEMS device 474 are conveyed to the MEMS device 474 via MEMS pads 479 formed on the MEMS wafer 472, which are congruent with and connected to the interconnect pads 466 on the cap wafer 452 using the solder patterns 478. Similarly, bond pads 480 formed on the MEMS wafer 472 are also congruent with and connected to the bond pads 468 formed on the cap wafer 452. Most importantly, the MEMS cavity 470 is congruent with the MEMS device 474 when superposed over the MEMS device 474 so that the movement of the movable structure 476 is unimpeded within the MEMS cavity 470. Alternatively, the cap wafer 452 may be bonded to the MEMS wafer 472 using a **bonding** material such as metal or solder suitable for **thermocompression** or the like compression processes instead of the solder patterns 478. To complete the wafer-level MEMS package, solder bumps are applied to the interconnect pads 464 and the wafer stack singulated. Alternatively, the solder bumps may be formed directly in place of the interconnect pads 464 formed during the Cap Wafer Processing step 408 by switching the electroplating solution and/or process after the electroplating process in the Via Electroplating step 406 to appropriately apply the solder bumps.

Detailed Description Text - DETX (22):

In a Wafers **Bonding** step 506, the cap wafer 552 is bonded to the MEMS wafer 572 using **thermocompression** or the like compression processes to form a wafer stack. The MEMS pads 579 formed on the MEMS wafer 572, which are congruent with the interconnect pads 566 on the cap wafer 552, and the **bond** pads 580 formed on the MEMS wafer 572, which are also congruent with the **bond** pads 568 formed on the cap wafer 552, are bonded via the application of **thermocompression on the bonding** patches 568. Most importantly, the MEMS cavity 570 is congruent with the MEMS device 574 when superposed over the MEMS device 574 so that the movement of the movable structure 576 is unimpeded within the MEMS cavity 570. Alternatively, the cap wafer 552 may be bonded to the MEMS wafer 572 by a eutectic method such as solder-to-metal or metal-to-metal bonding instead of bonding patches 568.

Detailed Description Text - DETX (39):

With reference to FIG. 7, a method of providing hermetic sealing for a wafer-level MEMS package according to an embodiment of the invention is illustrated. A cap wafer 752 and a MEMS wafer 772 may through **thermocompression** or the like compression processes 786 be hermetically sealed if a hermetically sealing material, such as Frit glass, is used in place of the solder patterns 378/478 or the **bonding** patches 582 used in the foregoing embodiments. In addition, the bonding pads 368/380/468/480/568/589 used in the foregoing embodiments have to be continuous pads encompassing the MEMS pads 379/479/579 so that when bonded therebetween using the hermetically sealing material form a gasket around the MEMS device.

US-PAT-NO: 7170155

DOCUMENT-IDENTIFIER: US 7170155 B2

TITLE: MEMS RF switch module including a vertical via

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Description Paragraph - DETX (21):

MEMS die 102 includes a seal ring 122A and the cap section 104 includes a seal ring 122B. When the MEMS die 102 and the cap section 104 are coupled together, the seal rings 122A and 122B are pressed together to form a hermetical seal. The seal rings 122A and 122B can be sealed using solder, gold **thermocompression bonding** (TCB), gold thermosonic **bonding** (TSB), or the like. Thus, when the MEMS RE switch module 100 is sealed, the cavity around RE switch array 124 is sterile to reduce the affects of dust and other contaminants on the performance of the RF switch array 124. In one embodiment, the seal rings 122A and 1228 are metal. In another embodiment, only one of MEMS die 102 or cap section 104 includes the seal ring prior to coupling MEMS die 102 and cap section 104 together.